Tubes, catheters, and drains

DRAINS

A drain is a created channel which allows any collected fluid to come out after closure of the main wound.

Types:

1. **Corrugated rubber drain:** it drains by capillary action and gravity. It is cheaper and technically easier to insert. Its disadvantage that it causes soaking and hence discomfort to the patient.
2. **Tube drain**
   - Multiple perforated tubes
   - Penrose soft latex rubber tube
   - Malecot catheter can be used as tube drain
3. **Closed suction tube drain system.**
4. **Glove drain, Wick drain** is a gauze drain to drain pus, discharge, etc.
Advantages of tube drains:

- Quantity of fluid like bile, pus can be measured
- It can be kept for longer time
- Skin excoriation will not occur
- Patient will be more comfortable
- Infection rate is less
- Easy removal
- Dye can be injected and cavity or communication can be assessed using 'C-ARM'

Classification of Drain System

a. Open (static) drains: e.g. corrugated drain, Penrose drain (soft latex rubber tubing). Infection rate is higher.
b. *Closed siphon drains:* Here drain is connected to a sterile bag with or without one-way valve. It reduces the infection.

c. *Closed suction drains:* Here negative pressure of -100 to -500 mmHg is used to create vacuum to drain the secretions.

d. Sump suction drain: Here negative suction with a parallel air-vent is used to prevent the adjacent soft tissues being sucked into the lumen of the drain.

e. Under water seal drain to drain pleural

**Indications for Drains**

1) In drainage of an abscess.
2) In bleeding surgical conditions like trauma, peroperative bleeding
3) In haemo, pyo or pneumothorax.
4) In acute abdominal conditions like peritonitis, haemoperitoneum.
5) In major abdominal surgeries like of pancreas, biliary tree, stomach, etc.
6) In thyroid surgery.
7) In hydrocoele surgery, complicated hernia surgery, and evacuation of haematomas.

Complications of Drains

1. Infection through the drain.
2. Displacement.
3. It may not drain adequately and can give a false information.
4. It may interfere with healing process inside. Presently keeping a drain itself is a questioned debate and controversy all over. Older dictum was 'when in doubt keep a drain and the surgeon can sleep happily'—is questioned at present. Drains if not used properly may be counter-productive. “And finally never use drain as sole monitor of wound”

Intercostal drainage tube
It is made up of portex with proximal end having multiple holes which is inserted in to the pleural space. Other end is connected to a glass tube the tip of which is dipped inside the under water bottle which allows the expulsion of air. This tube end should be dipped in the water column properly. Smaller glass tube often bent in between is not dipped inside the water column which allows the air to go out. It is used in haemothorax/pneumothorax/empyema/after thoracic and eosophageal surgeries. In haemothorax/ empyema, chest tube is inserted in the mid axillary line in 6th intercostal space. It is easier to pass the tube in this line as muscles are thin and patient will be comfortable if tube is in this position.
Catheters
These are hollow tubes used to relieve urinary retention, obtain urine for analysis, irrigate bladder and to instill drugs into bladder.

Types (according to texture)
1- Rubber Catheter
Red in colour contains high sulfur. Heat resistant. Causes more irritation.

2- latex Rubber Catheter
Softer, smooth, less irritant. It can be kept for long time.
Sterilized by boiling, autoclave or gamma radiation.

3- Polyethylene catheter: transparent and stiffer.

4- Metal catheter: Female and male catheters are different. Used in difficult catheterization, also to empty bladder prior to vaginal hysterectomy.

Types according to fixation:
• Non self-retaining catheter: Simple red rubber catheter.
• Self-retaining catheter: Foley's catheter, Malecot's catheter, Gibbon's catheter, De-Pezzer catheter.

Types of Catheterization
1- Indwelling catheterisation: When a catheter is left behind in bladder and remains so it is called an indwelling catheter.
It is achieved by:
Balloon tip of catheter - Foley's catheter.
Flower tip of catheter - Malecot's catheter, De-Pezzers.
Strapping catheter externally - Gibbon's catheter.

2- Intermittent catheterisation: A sterile catheter is introduced intermittently by the patient or by others.
FOLEY'S CATHETER

(FREDRICK EUGENE BASIL FOLEY AMERICAN UROLOGIST):

It is a *self retaining* urinary catheter made up of *latex*. It has got a balloon near the tip into which distilled water is infused to make it *self-retainable*. Usually Foley's catheter is kept for 7 days. It is *sterilized* by γ-radiation.

**Size:**

- Adults -16 F
- Children - 8 F or 10 F
(F- French unit, Charriere unit, where each unit equals 0.33 mm). 16 F means circumference of the catheter is 16 mm. Diameter is one third of circumference).

Uses

1- In retention of urine of any cause (BPH, stricture, trauma)
2- To measure the urine output in renal failure, postoperative patients, and terminally ill patients, and patients under critical care
3- After prostatectomy or TURP - three way catheter is used for irrigation also. Here it is also used as haemostatic by inflating more distilled water in to the balloon and giving traction causing tamponade effect
4- Paraplegia/neurogenic bladder—initially Foley's catheter is used later condom drainage is better
5- To give bladder wash in haematuria, infection, etc.
6- Percutaneous suprapubic cystostomy
7- Cholecystostomy
8- To drain fistulas
9- To control bleeding from nostrils/post haemorrhoidectomy secondary haemorrhage.
10- In children to give enema or to do barium/ contrast enema X-rays.

Types (According to number of channels)

1- Two-way Foley's.
2- Three way Foley's- To give bladder irrigation e.g. Following TURP.
3- *Silicon coated Foley's*: To reduce reaction and so as to keep for longer period (3 months).

Procedure

After cleaning under strict asepsis, lignocaine gel is lubricated into the urethral meatus. Catheter is connected to an *uribag*, then passed into the urethra. Sometimes *introducer* is used to pass Foley's catheter. Once catheter is in the bladder, urine will flow out. Balloon is inflated with 10-30 ml (amount is written on the catheter) of distilled water to make it self retainable. During removal of the catheter same amount of water should be removed from the balloon before pulling out the catheter.

Complications:

1. *infection*.
2. *Encrustation*.
3. *Bleeding*.
4. *Stone formation*.
5. *Blockage, false passage*.
6. *Stricture*.
7. *Difficulty in removal of the catheter due to blockage of the balloon channel*. The balloon of the Foley's can be punctured from ultrasound guidance or injection of Ether into the balloon so as to burst it but cause chemical cystitis or passing a stilette wire into the channel.

**MALECOT’S CATHETER**
- It is self-retaining urinary catheter umbrella or flower at the tip. It is made of rubber, contains sulphur and so it opaque.
- It is never introduced per urethra.

Advantages

- Malecot’s catheter can be kept for period of time (3 months)
- It drains fluid adequately.
- Less infection rate.
- Removal is easy.

Uses

- **Suprapubic cystostomy (SPC).**
  - In case of urinary retention when Foley’s catheterization fails (after two trials)
  - For diversion of urine following bladder, prostate or urethral surgeries
  - **To drain abscess cavity.**

  - Perinephric abscess
  - Pyonephrosis
  - Subphrenic abscess
  - Amoebic liver abscess

- **In nephrostomy**
- **In Cholecystostomy**
- **Gastrostomy, and caecostomy (tube type)**
SUPRAPUBIC CYSTOSTOMY:

It is placing of Malecot catheter into the bladder above the pubis by open method, or per-cutaneous under US guidance using Foley's catheter.

It is a temporary opening through the abdomen into the bladder.

Pre requisite: Bladder must be full and is confirmed by dullness below the umbilicus or by ultrasound.

Indication: Retention of urine when urethral atheterisation fails.

Procedure: Under local anaesthesia (Xylocaine 2% above the pubis, in the midline) or G/A, a vertical midline incision of 3 cm in length is placed through the linea alba. Skin, fascia, anterior rectus sheath are incised. Recti are retracted. In the extraperitoneal space, the peritoneum with pad of fat is reflected upward. Bladder is identified by detrusor muscle pattern and vesical venous plexus and is confirmed by aspirating urine by a syringe. The bladder is opened near its fundus. Urine is aspirated. Bladder wall is inspected for any pathology. Malecot's catheter is straightened using artery forceps and placed m the bladder. Sutures are placed around the Malecot's catheter. Urinary bladder and the wound are closed in layers. In percutaneous SPC, Foley's catheter is passed into the bladder using trocar and cannula.

Nelaton catheter:

It is a nonself-retaining urinary catheter. It is stiffer than Foley's catheter. Its tip is rounded and blunt. Opening is only on the side wall.
Uses

- Used to drain urine from the bladder temporarily in retention of urine.
- To find out residual urine. After passing urine, catheter is introduced into the bladder. The amount of retained urine is measured. If it is more than 30-50 ML, it signifies obstruction. It often increases more than 200 ml in conditions like BPH and indicates significant obstruction that needs surgical intervention like TURP.
- While doing cystography to infuse dye in to the Urinary bladder
- Single gentle passage of the Catheter is tried as a diagnostic method to identify the urethral/bladder/renal injuries. Haematuria signifies urinary tract injury.
- For administration of intravesical chemotherapy in bladder carcinoma.
- To collect urine from the bladder for culture and sensitivity.
- To dislodge and push back the calculus impacted in the urinary meatus or in the urethra.
- For suction of throat/endotracheal tube/ tracheostomy tube.
- Can be used as tube drain.
Depezzer’s catheter:

It is a self-retaining catheter with a bulb at the end, which makes it self-retaining. Its uses are like Malecot's catheter. It can not be passed per urethra. Usually 24 French size is used.

Gibbon catheter:

It is a self-retaining catheter made up of plastic with a stillete in it, which makes its passage easier through urethra. There are different sizes for males and females because of the difference in length of the urethra in male and female. Catheter has two ribbons attached, which can be used to fix to the genitalia by adhesive plaster. Gibbon's catheter is least irritant to urethra.
**URETERIC CATHETER**

It is thin slender flexible radio-opaque tube of 70 cm length with a black mark at every 5 cm junction. French unit is used. 3-8 French (F) are available. Initially cystoscope is passed and under visualization, ureteric catheter is passed through ureteric orifice with a stillete. The Stillete maintains the stiffness and patency of the catheter. It is used while doing retrograde pyelography (RGP); to collect selective urine sampling in tuberculosis; to assess and relieve the ureteric obstruction; and as a ureteric stent.

**NASOGASTRIC OR RYLE’S TUBE**

It is one meter and made up of red rubber or plastic. Original Ryle's tube was made up of red rubber. Now a days nasogastric tubes are made up of polyethylene or portex. Tip is blunt without opening. Sub-
terminal multiple openings are present on all the sides. It is sterilized by gamma rays.

It has three lead shots in the tip, which makes it radio-opaque. Once tube is inside the stomach, bile/gastric juice will come out of the proximal end, often confirmed by aspiration. Stethoscope is placed over the stomach; syringe with air is pushed in to the tube; if tip of the tube is in the stomach air entering in to the stomach can be heard through the stethoscope.

It is passed through one of the nostrils using KY Jelly or xylocaine 2% jelly. Under anaesthesia it is passed using Magill's forceps. It should be fixed securely to the nostrils otherwise; it may be displaced or come out. It should be replaced with new tube in 2 weeks if needed.

In the postoperative period, it can be removed once patient passes flatus; or bowel sounds are heard; content in the collecting bag reduced to less than 50 ml.

It has markings at different levels: (except if kinked)

- At 40 cm distance, indicates the level of the gastro-esophageal junction.
- At 50 cm distance, indicates the level of the stomach.
- At 60 cm distance, indicates the level pylorus.
- At 65 cm distance, indicates the level duodenum.
Complications

• Injury to nostrils and bleeding
• Pharyngitis / rhinitis.
• Discomfort/unacceptance.
• Ulceration in the pharynx/oesophagus.
• Aspiration pneumonia as lower sphincter is kept open—dangerous complication—may cause death also,
• Perforation of oesophagus.